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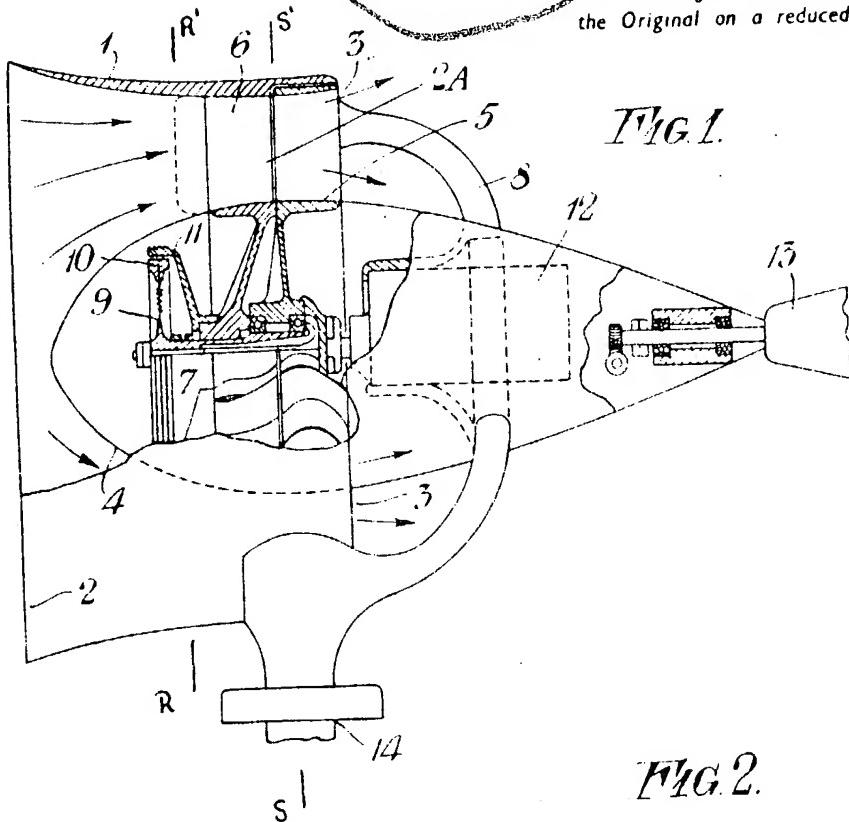
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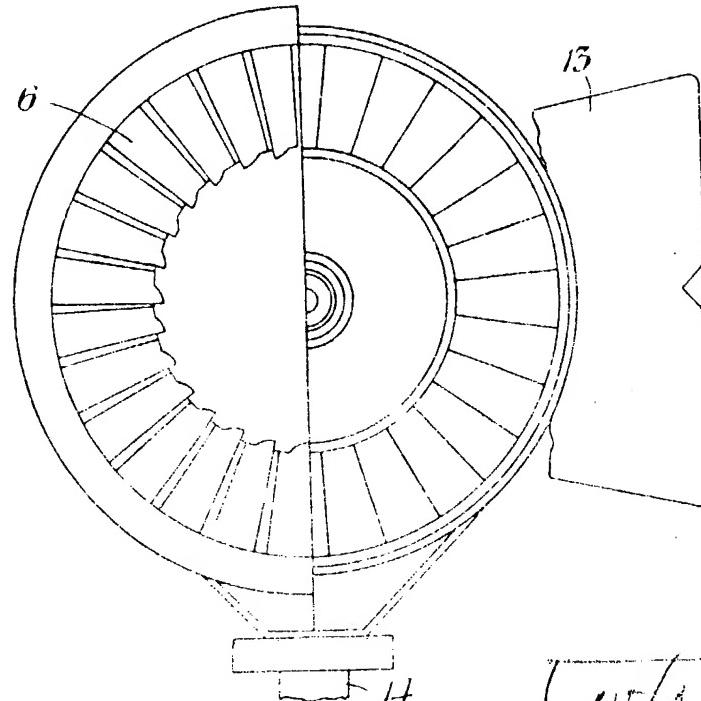
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695.519 COMPLETE SPECIFICATION

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415-4.3

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PATENT SPECIFICATION

695,519



Date of Application and filing Complete Specification: Aug. 15, 1951.

No. 19298/51.

Application made in Portugal on March 30, 1951.

Complete Specification Published: Aug. 12, 1953.

Index at acceptance: Class 110(iii), W1a, W2c(1; 2).

COMPLETE SPECIFICATION

Wind Turbines

I, ANTONIO FELIX RIBEIRO, of Rua da Ilha Terceira No. 38-30, Lisbon, Portugal, a citizen of the Portuguese Republic, do hereby declare the invention, for which I pray that patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a wind turbine adapted to be driven by displacement of air arising from wind currents.

Heretofore windmills and wind-pumps have been found to possess low efficiency 15 which thus imposes limitations on the work each machine is capable of performing.

The object of the present invention is to obviate the above disadvantage and 20 provide a machine of relatively simple construction capable of high efficiency and speed.

According to the invention a wind turbine comprises an outer casing or duct 25 formed with a flared inner surface of convergent-divergent configuration decreasing in diameter from an air-intake mouth at one end thereof to a zone of minimum diameter and increasing in diameter from said zone of minimum diameter to an air discharge port at the other end, a substantially egg-shaped central member concentric with said outer casing or duct, the minimum diameter of said outer casing being coplanar with the maximum diameter of said central member, a turbine wheel mounted for rotation inside said casing, and the arrangement being such that air entering 30 the air-intake mouth is caused to increase its velocity while progressing along the annular intake of continuously decreasing area to a maximum velocity that is attained when the air arrives at the 35 blades of the turbine wheel, the air then leaving the device at the said discharge port.

For a better understanding of the invention, and to show how it may be carried into effect, the same will now be described with reference to the accompanying drawings wherein:—

Figure 1, shows a partially cut-away section through the wind turbine, and

Figure 2, shows a partial section on 65 each of the lines R-R¹ and S-S¹ of Figure 1.

In the embodiment there is illustrated an outer casing 1 of annular cross section having a flared inner surface of convergent-divergent configuration decreasing in diameter from an air-intake mouth 2 situated at one end thereof to a zone of minimum diameter 2A and increasing in diameter from said zone to an annular air discharge port 3 at the opposite end thereof, said discharge port being of larger diameter. Within the casing 1 is mounted concentrically a substantially egg-shaped central member 4 having a turbine wheel 5 for rotation therein on an axial spindle 7, the rotor of said turbine wheel having a surface that is coincident with the development of the form of said central member 4 75 which is so mounted that its maximum diameter is coplanar with the minimum inside diameter 2A of the outer casing 1.

Between the central member 4 and the outer casing 1 at the above mentioned coplanar portion is mounted an annular pattern of stationary distributing blades 6 arranged to unite the said outer casing 1 and the said central member 4. It will be seen that arm 8 assists in effecting a rigid structure between the said casing, distributing blades and central member.

A centrifugal governor 9 is adapted to control the speed of the turbine by means of a brake shoe 10 acting on a brake drum 11, and is actuated by the spindle 7. The speed of the turbine may either be controlled by the above mentioned braking means or by a shutter means blank-

ing off a portion of the air-intake mouth 2 thereby restricting the inflow of air.

The turbine may be adapted to drive an electric generator, pump 12, or any other mechanism, as desired.

The rear of the central member 4 is provided with a dove-tail rudder 13 of the like in known manner the entire ensemble is adapted to pivot at 14 about a vertical axis when secured to any convenient structure.

The apparatus is normally made from light materials and the inner circumference of the outer casing 1 and the central member 4 is preferably formed from highly polished thin sheet metal to facilitate air flow.

When in use, air enters the air-intake mouth 2 and is caused to increase its velocity while progressing along the progressively decreasing annular intake until upon reaching the stationary distributing blades 6 the air is deflected on to the turbine wheel 5 thus causing the latter to rotate. The spent air is then ejected at the discharge port 3. It will be apparent that the increased velocity imparted to the air flow will increase the power output normally produced. The speed of the turbine is controlled by the centrifugal brake above mentioned.

In, for example, Hütte, volume II, 21st edition, page 3 — Windmills, where:

$$35 \quad N = \frac{\delta \cdot F \cdot V^3}{g \cdot 150}$$

where:

N = Power in H.P.

δ = Density of air (1.29)

F = Area opposed to air

40 V = Speed of wind (m/sec.)

G = Acceleration of gravity (9.8 m/sec.)

If we make:

$F = 1$ square metre

$V = 8$ m/sec.

45 We will have:

$$N = \frac{1.29 \cdot 1^2 \cdot 8^3}{9.81 \cdot 150} = 0.35 \text{ H.P.}$$

which is the power of a conventional windmill.

Now since in my invention the speed of 50 the air is increased in the ratio of 1:2 or better we will have, using the same values,

$$N = \frac{1.29 \cdot 1^2 \cdot 16^3}{9.81 \cdot 150} = 3.5 \text{ H.P.}$$

Comparing this result with those yielded by the best windmills we have: 55

1. Halladay—Disk 3 m ϕ (Area 7 sq. m.)

With a wind speed of 8 m/sec. 0.6 H.P.

2. Goliath—Disk 3 m ϕ (Area 7 sq. m.)

With a wind speed of 8 m/sec. 1.0 H.P.

3. Ultra—Disk 3.5 m ϕ (Area 9.6 sq.m.) 60

With a wind speed of 8 m/sec. 1.25 H.P.

It is apparent that whilst in my turbine a surface of 1 square metre gives a power of 3.5 H.P., the most efficient models already known do not allow more than 65 1/6 to 1/3 of that power.

What I claim is:—

1. A wind turbine comprising, an outer casing, or duct formed with a flared inner surface of convergent-divergent configuration decreasing in diameter from an air-intake mouth at one end thereof to a zone of minimum diameter and increasing in diameter from said zone of minimum diameter to an air discharge port at the other end, a substantially egg-shaped central member concentric with said outer casing, or duct, the minimum diameter of said outer casing being coplanar with the maximum diameter of 80 said central member, and a turbine wheel mounted for rotation inside said casing, the arrangement being such that air entering the air-intake mouth is caused to increase its velocity while progressing 85 along the annular intake of continuously decreasing area to a maximum velocity that is attained when the air arrives at the blades of said turbine wheel, the air then leaving the device at the said discharge port. 90

2. A wind turbine as claimed in claim 2, wherein the rotor of the turbine wheel has an outer surface that is coincident with the development of the outer curved portion of the central member. 95

3. A wind turbine as claimed in claim 2 or claim 3, wherein a centrifugal brake mounted inside the central member acts on a brake drum at a predetermined speed 100 to control the turbine wheel revolutions.

4. A wind turbine as claimed in claim 2 or claim 3, wherein a centrifugal governor fitted inside the central member and adapted to function at a predetermined speed actuates a shutter mounted at the air-intake mouth to control the entry of air into the turbine and therefore the speed of the latter. 105

5. A wind turbine substantially as 110 hereinbefore described with reference to the accompanying drawings.

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England, and
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New York, U.S.A.
Agents for the Applicant.

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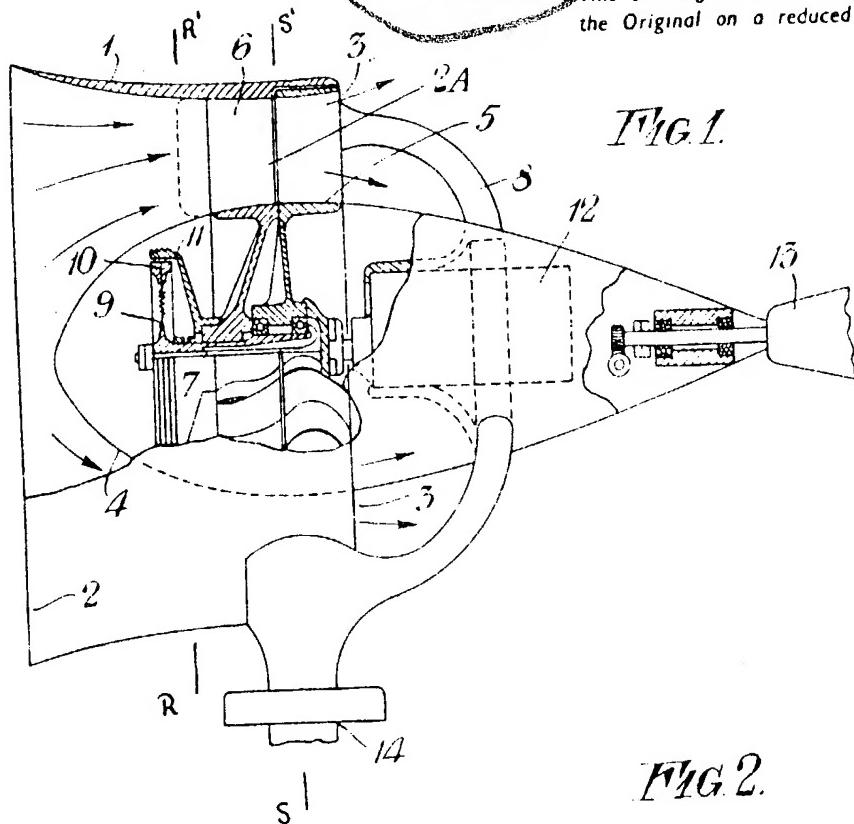
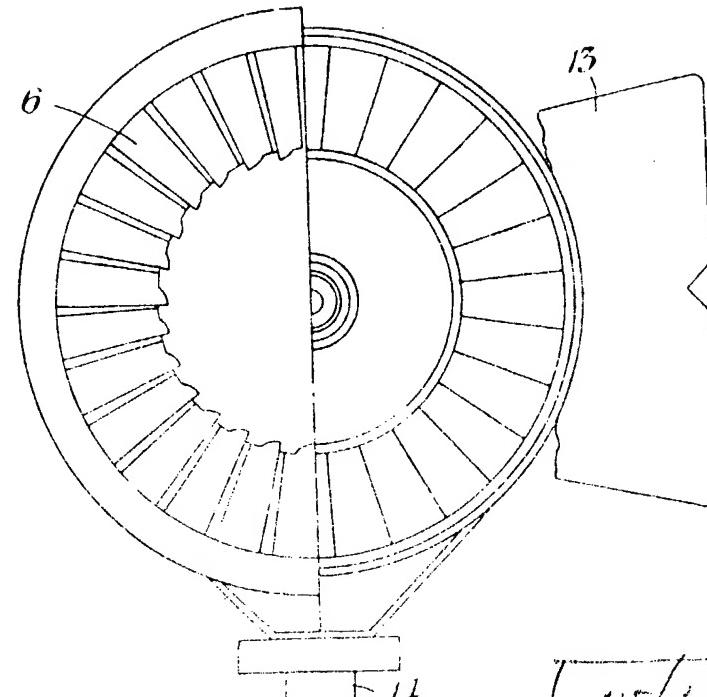
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FIG. 1.



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WHEEL
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40 The air-intake mouth is caused to increase its velocity while progressing along the annular intake of continuously decreasing area to a maximum velocity that is attained when the air arrives at the blades of the turbine wheel, the air then leaving the device at the said discharge port.

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Between the central member 4 and the outer casing 1 at the above mentioned coplanar portion is mounted an annular pattern of stationary distributing blades 6 arranged to unite the said outer casing 1 and the said central member 4. It will be seen that arm 8 assists in effecting a rigid structure between the said casing, distributing blades and central member.

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